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09/893,264	06/27/2001	Nir N. Shavit	112047-0036	1888

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EXAMINER

TANG, KENNETH

ART UNIT	PAPER NUMBER
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2127

DATE MAILED: 09/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/893,264

Applicant(s)

SHAVIT ET AL.

Examiner

Kenneth Tang

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 10 May 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-57 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-57 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 June 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 6/27/01.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### **DETAILED ACTION**

1. Claims 1-57 are presented for examination.

#### ***Specification***

2. Applicant is required to update the Cross-Reference to Related Application section in the introductory paragraph (page 1) and on pages 11-12 of the Specification to include the application number or patent number (if issued) of the related applications.

#### ***Drawings***

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the “global status word” must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled “Replacement Sheet” in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the

drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Information Disclosure Statement***

4. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A(1) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.
5. Applicant is required to provide a copy of the non-patent literature reference (revealed on page 13 of the Specification) by Nimar S. Arora et al., entitled "Thread Scheduling for Multiprogrammed Multiprocessors," in the 1998 Proceedings of the Tenth Annual ACM Symposium on Parallel Algorithms and Architectures.

### ***Claim Objections***

6. Claims 1, 15, 29, 43, and 57 are objected to because of the following informalities:  
"and," should be replaced with ",and" in line 16. Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 1-57 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention:

a. In claims 1, 15, 29, 43, and 57, “so operates the threads” (line 6) is indefinite because it is not made explicitly clear in the claim language what or who is doing the operating.

b. In claims 1, 15, 29, 43, and 57, “an activity-indicating value” (lines 19-20) is indefinite because it is not made explicitly clear in the claim language whether this is the same as the “an activity-indicating value” (in line 16) or if a new activity-indicating value is being introduced.

8. Claims 1-57 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are:

a. In claims 1, 15, 29, 43, and 57, there is no structural relationship between “an activity-representing value” (line 10) and either “an inactivity-indicating value” or “an activity-indicating value” (lines 16 and 19). It is not made clear in the claim language whether or not the inactivity-indicating and activity-indicating values are the types of the activity-representing value.

b. In claims 1, 15, 29, 43, and 57, the structural relationship between “a global status word” (line 4) and the “separate status-word field associated with each of the threads” (lines 4-5) is not made explicitly clear in the claim language. It is unclear how the global status word works and interacts with the separate status-word field (with possibly different statuses in the fields) associated with each of the threads.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**2. Claims 1-5, 7-9, 11-19, 21-23, 25-33, 35-37, 39-47, 49-51, and 53-57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Blleloch et al. (hereinafter Blleloch) (US 6,434,590 B1) in view of Kawachiya et al. (hereinafter Kawachiya) (US 2001/0025295 A1).**

3. As to claim 1, Blleloch teaches a computer system that employs a plurality of threads of execution to perform a parallel-execution operation in which the threads identify tasks dynamically and in which the computer system:

A) provides a separate status-word field (status buffers SB1) associated with each of the threads (*col. 5, lines 22-35*); and

B) so operates the threads that each thread (*col. 5, lines 19-47*):

i) executes a task-finding routine to find tasks previously identified dynamically and performs tasks thereby found, with the status-word field associated with that thread containing an activity representing value (live tasks), until the task-finding routine finds no more tasks (*col. 12, lines 3-15, col. 13, lines 47-65*);

ii) when the task-finding routine finds no more tasks, sets the contents of the status-word field associated with that thread to an inactivity-indicating value (updates the status buffer SB1) (*col. 5, lines 19-48*);

iii) while the status-word field associated with any other thread contains an activity-indicating value, searches for a task and, if it finds one, sets (updates) the status-word field to the activity-indicating value before attempting to execute a task (*col. 5, lines 19-48*); and

iv) if none of the status-word fields contains an activity-indicating value, terminates (operation ends) its performance of the parallel-execution operation (*col. 5, lines 40-52*).

4. Blleloch teaches using a buffer manager BM1 to manage the various status buffers SB1 (contains the status-word field) (*col. 5, lines 22-35*) but fails to explicitly teach using a global status word that is associated with the separate status-word field of the threads. However, Kawachiya teaches a parallel processing garbage collection system that uses global reference objects of states/status associated and substituted with other objects of states/status (*page 2, [0020]*). It would have been obvious to one of ordinary skill in the art at the time the invention was made to include the feature of using a global status word that is associated with the separate status-word field of the threads because this would increase the control of the system by allowing

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the thread to detect the occurrence of a condition whereby the state of object should be changed  
(*page 2, [0020]*).

5. As to claim 2, Kawachiya teaches a computer system wherein the parallel-execution operation is a garbage-collection operation (*page 1, [0014]*).

6. As to claim 3, Blelloch teaches a computer system as defined in claim 1 wherein:  
A) each thread has associated with it a respective work queue in which it places task identifiers of tasks that identifies dynamically; B) the task-finding routine executed by an executing thread includes performing an initial search for a task identifiers in the work queue associated with the executing thread and, if that work queue contains no task identifiers that the executing thread can claim, thereafter performing a further search for a task identifier in at least one other task-storage location (*col. 5, lines 19-52, col. 12, lines 3-15, col. 13, lines 47-65*).

7. As to claim 4, Kawachiya teaches a computer system wherein the parallel-execution operation is a garbage-collection operation (*page 1, [0014]*).

8. As to claim 5, Blelloch teaches a computer system wherein the at least one other task-storage location includes at least one work queue associated with a thread other than the executing thread (*col. 5, lines 19-52*)



9. As to claim 7, Blelloch in view of Kawachiya fails to explicitly teach wherein the task-finding routine includes selecting in a random manner the at least one work queue associated with a thread other than the executing thread. However, "Official Notice" is taken that both the concept and advantages of providing that selecting in a random manner at least one work queue associated with a thread other than the executing thread is well known and expected in the art. It would have been obvious to one of ordinary skill in the art at the time the invention was made to include selecting in a random manner at least one work queue associated with a thread other than the executing thread to the existing system in order to ensure an unbiased selection.

10. As to claim 8, Blelloch teaches wherein the further search includes repeatedly searching a work queue associated with a thread other than the executing thread until the executing thread thereby finds a task or has performed a number of repetitions equal to a repetition limit greater than one (*col. 5, lines 19-52*).

11. As to claim 9, it is rejected for the same reasons as stated in the rejection of claim 7.

12. As to claim 11, Blelloch teaches wherein the status word fits in a memory location accessible in a single machine instruction (every action requires a single time step to be executed) (*col. 11, lines 12-15*).

13. As to claim 12, Blelloch teaches a computer system wherein the parallel-execution operation is a garbage-collection operation (*page 1, [0014]*).

14. As to claim 13, Blelloch teaches wherein each status-word field is a single-bit field (flag) (*col. 6, lines 44-67*).

15. As to claim 14, Blelloch teaches wherein the activity-indicating value is a logic one and the inactivity-indicating value is a logic zero (flag) (*col. 6, lines 44-67*).

16. As to claim 15, it is rejected for the same reasons as stated in the rejection of claim 1.

17. As to claim 16, it is rejected for the same reasons as stated in the rejection of claim 2.

18. As to claim 17, it is rejected for the same reasons as stated in the rejection of claim 3.

19. As to claim 18, it is rejected for the same reasons as stated in the rejection of claim 4.

20. As to claim 19, it is rejected for the same reasons as stated in the rejection of claim 5.

21. As to claim 21, it is rejected for the same reasons as stated in the rejection of claim 7.

22. As to claim 22, it is rejected for the same reasons as stated in the rejection of claim 8.

23. As to claim 23, it is rejected for the same reasons as stated in the rejection of claim 9.

24. As to claim 25, it is rejected for the same reasons as stated in the rejection of claim 11.
25. As to claim 26, it is rejected for the same reasons as stated in the rejection of claim 12.
26. As to claim 27, it is rejected for the same reasons as stated in the rejection of claim 13.
27. As to claim 28, it is rejected for the same reasons as stated in the rejection of claim 14.
28. As to claim 29, it is rejected for the same reasons as stated in the rejection of claim 1.
29. As to claim 30, it is rejected for the same reasons as stated in the rejection of claim 2.
30. As to claim 31, it is rejected for the same reasons as stated in the rejection of claim 3.
31. As to claim 32, it is rejected for the same reasons as stated in the rejection of claim 4.
32. As to claim 33, it is rejected for the same reasons as stated in the rejection of claim 5.
33. As to claim 35, it is rejected for the same reasons as stated in the rejection of claim 7.
34. As to claim 36, it is rejected for the same reasons as stated in the rejection of claim 8.

- 35. As to claim 37, it is rejected for the same reasons as stated in the rejection of claim 9.
- 36. As to claim 39, it is rejected for the same reasons as stated in the rejection of claim 11.
- 37. As to claim 40, it is rejected for the same reasons as stated in the rejection of claim 12.
- 38. As to claim 41, it is rejected for the same reasons as stated in the rejection of claim 13.
- 39. As to claim 42, it is rejected for the same reasons as stated in the rejection of claim 14.
- 40. As to claim 43, it is rejected for the same reasons as stated in the rejection of claim 1.
- 41. As to claim 44, it is rejected for the same reasons as stated in the rejection of claim 2.
- 42. As to claim 45, it is rejected for the same reasons as stated in the rejection of claim 3.
- 43. As to claim 46, it is rejected for the same reasons as stated in the rejection of claim 4.
- 44. As to claim 47, it is rejected for the same reasons as stated in the rejection of claim 5.
- 45. As to claim 49, it is rejected for the same reasons as stated in the rejection of claim 7.

- 46. As to claim 50, it is rejected for the same reasons as stated in the rejection of claim 8.
- 47. As to claim 51, it is rejected for the same reasons as stated in the rejection of claim 9.
- 48. As to claim 53, it is rejected for the same reasons as stated in the rejection of claim 11.
- 49. As to claim 54, it is rejected for the same reasons as stated in the rejection of claim 12.
- 50. As to claim 55, it is rejected for the same reasons as stated in the rejection of claim 13.
- 51. As to claim 56, it is rejected for the same reasons as stated in the rejection of claim 14.
- 52. As to claim 57, it is rejected for the same reasons as stated in the rejection of claim 1.

***Allowable Subject Matter***

- 53. Claims 6, 10, 20, 24, 34, 38, 48, and 52 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.


***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kenneth Tang whose telephone number is (571) 272-3772. The examiner can normally be reached on 8:30AM - 6:00PM, Every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng-Ai An can be reached on (571) 272-3756. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Kt  
9/17/04

  
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